ROBERT WAGGENER - SBN - 118450
214 DUBOCE AVENUE
SAN FRANCISCO, CA 94103
Phone: (415) 431-4500
Fax: (415) 255-8631
E-Mail: rwlaw@mindspring.com

Attorney for Defendant ESAU FERDINAND

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA

Plaintiff,

v.

ESAU FERDINAND,

Defendant.
/

No. CR13 0764 WHO

MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF MOTION TO EXCLUDE EVIDENCE FROM DNA TESTING PERFORMED BY SEROLOGICAL RESEARCH INSTITUTE AND REQUEST FOR *DAUBERT* HEARING

Date: January 22, 2016
Time: 9:00 a.m.
Crtrm.: Honorable William H. Orrick

TO: THE UNITED STATES DISTRICT COURT; ASSISTANT UNITED STATES ATTORNEYS WILLIAM FRENTZEN, DAMALI TAYLOR AND SCOTT JOINER; ALL DEFENSE COUNSEL; AND TO THE CLERK OF THE COURT:

INTRODUCTION AND STATEMENT OF FACTS

The Jelvon Helton homicide occurred on November 1, 2010. Defendant Esau Ferdinand is not substantively charged with committing the homicide, but the homicide is charged as part of the RICO conspiracy in the Second Superseding Indictment, and Mr. Ferdinand is essentially alleged to have been an aider and abettor in the homicide. One item of evidence seized close in time to the homicide is a red baseball cap with a black bill or visor, with a Cincinnatti Reds logo on the front. Some time after the homicide an Acura automobile suspected to be connected to the homicide was seized and forensically tested. Three DNA swabs were taken from the red baseball cap, from the front and rear halves of the sweatband inside the cap, and from the inside dome of

the cap. The Acura automobile was swabbed for DNA, including swabs taken from the steering wheel, the front passenger handle, and from a rear driver carpet stain.

The Serological Research Institute ("SERI") was asked by the government to conduct DNA testing on the swabs from the red cap and the Acura and compare them with a blood sample from Jelvon Helton from which a DNA sample was extracted, DNA from buccal swabs of defendants Esau Ferdinand, Jacquain Young, Alfonzo Williams, and Adrian Gordon, and from an individual named Vernon Carmichael.[1/] The testing of the red baseball cap swabs at SERI was conducted by Chief Forensic Serologist Gary Harmor, and the testing of the Acura swabs was conducted by Forensic Serologist Cassaday Baker. All the recovered DNA from each extract sample was analyzed by the Polymerase Chain Reaction method ("PCR"). Mr. Harmor issued an Analytical Report of the testing results on January 27, 2015 (BG078550), and Mr. Baker issued an Analytical Report on January 23, 2015 (BG078555).

As it relates to defendant Esau Ferdinand and the Jelvon Helton homicide and this motion, in its expert disclosure letter of October 21, 2015, the government provided the following expert disclosures as to Mr. Harmor and Mr. Baker:

> **Gary Harmor, Serological Research Institute**
>
> The government currently intends to call Gary Harmor, Director of the Serological Research Institute. His CV is attached. Gary Harmor will provide expert testimony regarding the DNA testing and analysis reflected in the following reports and underlying "discovery packages:" M'8826'09 (concerning 2009 funeral shooting), M'8602'10, M'8826'10 (concerning the Helton/Turner double homicide), M'9850'14 (concerning the Jelvon Helton murder). *See* BG084035- BG084842; BG085572- BG085999.
>
> Director Harmor will testify based upon his knowledge, training and experience as well as the testing performed. Director Harmor will opine regarding comparisons of questioned evidence against known DNA of the defendants and others, and regarding the statistical significance of the analysis. Director Harmor will testify regarding their ability to opine that certain DNA did, in fact, come from a known contributor. He will also testify regarding mixtures of DNA and the particular issues that arise when DNA reflects a mixture of more than one source. He will also testify regarding the ability to detect major contributors to a mixture of DNA and analyze the major contributor.
>
> .....

[1/] A buccal swab is a cotton swab used to collect DNA which is commonly rubbed on the inside of a person's cheek to collect cells located in and around that area.

We also currently anticipate that Harmor will testify to the following conclusions reflected in the M'9850'14 report:

• The genetic marker profile obtained from the back inside dome swabbing of the red baseball cap # I B 11 5 (item 3C) is a mixture from at least three individuals Jelvon Helton # I B2 19 could be a major contributor to this mixture. The chance someone unrelated to him could also be the major contributor is approximately one in 13 sextillion. Esau Ferdinand # I B232 could be a minor contributor to the mixture as well as approximately one in 12 persons with relationship to him.

• The genetic marker profile obtained from the rear sweatband swabbing of the red baseball cap # I B lI S (item 3B) is a mixture from at least three individuals. Jelvon Helton #1 B219 could be a major contributor to this mixture as well as approximately one in 6170 persons. Esau Ferdinand # I B232 could be a minor contributor to the mixture. Approximately one in every 55 individuals could also be contributors to the mixture with relationship to Esau Ferdinand.

• The genetic marker profile obtained from the front sweatband swabbing of the red baseball cap # I B lIS (item 3A) is a mixture from at least three individuals. Jelvon Helton # IB2 19 (item 1-1 , SERI Case No. M'9851'14) could be a possible contributor to this mixture as well as approximately one in 59,000 persons. Esau Ferdinand # I B232 (item 4A-I) and Vernon Carmichael # 1 B218 (item 2A-1. SERI Case No. M'9852'14) could be minor contributors to the mixture. Approximately one in every 9 individuals could also be contributors to the mixture with relationship to Ferdinand and Carmichael.

Casseday Baker, Serological Research Institute

The government currently intends to call Casseday Baker, of the Serological Research Institute. Her CV is attached. Baker will provide expert testimony regarding the DNA testing and analysis reflected in M'9851'14 (concerning the murder of Jelvon Helton) and the underlying "discovery packages:" (BG084536 – BG084735 and BG084842). These reports concern the murder of Jelvon Helton—reflected in Counts Eighteen through Twenty, as well as the attempted murder of Victim 3, as reflected in Counts Nine through Eleven.

Serologist Baker will testify based upon her knowledge, training and experience as well as the testing performed. Baker will opine regarding comparisons of questioned evidence against known DNA of the defendants and others, and regarding the statistical significance of the analysis. Baker will testify regarding their ability to opine that certain DNA did, in fact, come from a known contributor. She will also testify regarding mixtures of DNA and the particular issues that arise when DNA reflects a mixture of more than one source. She will also testify regarding the ability to detect major contributors to a mixture of DNA and analyze the major contributor.

We currently anticipate that Baker will testify to the following conclusions reflected in the M'9851'14 report:

• "DNA recovered from the steering wheel swab (item 2-2) is a mixture of at least four people. Esau Ferdinand and Vernon Carmichael are each included as possible contributors to the mixture. The chance that a

randomly selected person, unrelated to Esau Ferdinand and Vernon Carmichael would be similarly included as a possible contributor is one in ten. Jaquain Young is also included as a possible contributor. The chance that a randomly selected person, unrelated to Jaquain Young would be similarly included as a possible contributor is one in six hundred sixty.

 DNA recovered from the front passenger handle swab (item 2-3) is a mixture of at least three people. Esau Ferdinand is included as a possible contributor to the mixture. The chance that a randomly selected person, unrelated to Esau Ferdinand, would be similarly included is about one in two hundred eighty. Vernon Carmichael is also included as a possible contributor. The chance that a randomly selected person, unrelated to Vernon Carmichael, would be similarly included as a contributor is about one in eleven.

• DNA recovered from the rear driver carpet stain (item 5) is a mixture of at least three people. Jaquain Young is included as a possible contributor to the mixture. The chance that a randomly selected person, unrelated to Jaquain Young, would be similarly included as a contributor is about one in three thousand. Vernon Carmichael is also included as a possible contributor to the mixture. The chance that a randomly selected person, unrelated to Vernon Carmichael, would be similarly included as a contributor is about one in forty-eight.

The DNA issue raised by this motion is the reliability of the methodology and procedures utilized by SERI. Defendant Ferdinand submits that the Court, in its capacity as gatekeeper under *Daubert* and Rule 702 of the Federal Rules of Evidence, must exclude the type of flawed "scientific" evidence proffered by the government by Mr. Harmor and Mr. Baker. What is remarkable about the results relating to Defendant Ferdinand as to his SERI detected minor contribution to the various mixture samples are the very low reported contribution statistics. Rather than exponential numbers in the sextillions, the numbers for Mr. Ferdinand are in the double and triple digits. It is well recognized that data reliability is inferior when lower amounts of DNA are tested and detected, and the conclusions of SERI are all the more worthy of scrutiny because of their low statistical proportions and the potential for error.

I.

AN OVERVIEW OF FORENSIC DNA ANALYSIS

The creation of a genetic profile for purposes of forensic DNA analysis begins with the acquisition of human cells from the evidence. Once those cells are obtained, DNA is extracted from the cells and quantified. If a large quantity of high quality DNA has been

extracted, "RFLP" testing can be utilized to produce a "match" between the evidence DNA and the DNA from a known sample.[2/]

If only a minute quantity of DNA is extracted or that DNA is old or degraded, RFLP testing is not possible and "PCR/STR" testing can be utilized to develop a DNA profile. However, owing to its quantitative or qualitative limitations, PCR/STR testing is not designed to establish a "match" between DNA evidence and a known DNA sample, the goal of RFLP testing. Rather, PCR/STR testing is used to develop genetic profiles that can then be used to *exclude* or *include* individuals as possible contributors to a DNA sample.

II.

PCR/STR TESTING[3/]

The acronym "PCR" refers to the Polymerase Chain Reaction which occurs during the first phase of PCR testing. Although over 99% of the DNA in the human body is identical, scientists have identified several areas or "loci" along DNA strands that vary significantly among groups of people. These variations occur in the form of short sequences that are repeated multiple times. These sequences are called Short Tandem Repeats or "STRs." STRs can vary in length but the sequence is not usually repeated more than a few times. The loci where scientists have found such variation are called polymorphic. The variants of STRs present at any specific locus are called "alleles."

PCR/STR testing was utilized by SERI in this case. It can be divided into five phases: extraction, quantification, amplification, electrophoresis and interpretation.

A. Extraction

In order to test for the presence of human DNA, an analyst must first extract the DNA from the evidence sample. Extraction involves "breaking open" cells to release the DNA they contain. Once the DNA is released and extracted, it is purified.

[2/] RFLP testing is summarized in *United States v. Chischilly*, 30 F.3d 1144, 1153, fns. 8-10 (9th Cir. 1994). RFLP testing has largely been supplanted in recent years by PCR/STR testing.

[3/] This summary of PCR/STR testing draws on summaries of the testing procedure contained in *United States v. Hicks,* 103 F.3d 837, 845 (9th Cir. 1996), *United States v. Morrow*, 374 F.Supp.2d 51, 58 (D.C. 2005), *United States v. Davis*, 602 F.Supp.2d 658, 665-666 (D.Md. 2009), and *United States v. Shea*, 957 F.Supp. 331, 337 (D.N.H.1997).

B. Quantification

After the DNA is extracted and purified, an attempt is made to quantify the amount of DNA contained in a sample. Quantification is a critical stage in PCR/STR testing because there is a direct correlation between the quantity of DNA being tested and the reliability of the test results. If the quantity of DNA is too low, the PCR/STR test results will exhibit "stochastic effects"[4/] that cast doubt on their reliability. "Trying to generate a reliable STR profile with only a few cells from a biological sample is similar to looking for an object in the mud or trying to decipher the image in a fuzzy photograph." John Butler, *Fundamentals of Forensic DNA Typing* 331 (Academic Press 2010). For this reason, DNA laboratories commonly establish a "stochastic threshold" which sets the quantity in a DNA sample below which "a danger zone of unreliable results" exists. John Butler, *Advanced Topics in Forensic DNA Typing* 339 (Academic Press 2011). PCR/STR testing below this threshold is referred to as "LCN" (Low Copy Number) or "LT" (Low Template) testing.

If the DNA is from a "single source" (*i.e.* one individual), the issue is whether the total quantity of DNA falls above or below the stochastic level. However, if the sample is a "mixture" (*i.e.* from more than one individual), the issue becomes whether the total amount of DNA contributed by any one of those individuals is above or below the level likely to produce the stochastic effects that can make PCR/STR testing unreliable. *See e.g.,* Bruce Budowle, *Low Copy Number Typing Still Lacks Robustness and Reliability*[5/] 4 (Promega Corporation 2010). If an analyst cannot confidently determine whether the amount of DNA

[4/]The term "stochastic effects" refers to the observation of "allele drop-in," "allele drop-out," "stutter" and "heterozygote peak height imbalance" in the computer printouts generated by PCR/STR testing of samples containing small amounts of DNA. *See, e.g.,* Peter Gill, *Application of Low Copy Number DNA Profiling,* 42(3) Croatian Med. J. 229, 229-30 (2001). Because this is a preliminary motion challenging the DNA testing in this case, copies of the referenced scholastic articles are not being attached, in anticipation of further briefing. A large number of scholastic and academic articles are also already attached to co-defendant Adrian Gordon's motion to exclude DNA evidence which is incorporated by reference. (Dkt. No. 639)

[5/]Bruce Budowle served as Director of the FBI Nuclear DNA Unit in Quantico, Virginia for a number of years and currently teaches at the Institute of Investigative Genetics, Department of Forensic and Investigative Genetics, University of North Texas Health Science Center.

contributed by an individual to a DNA mixture is above or below the stochastic level, the result of PCR/STR testing for that individual cannot be considered reliable.

C. Amplification

"Amplification" involves the replication of DNA by a series of repeated, precisely controlled cycles of heating and cooling that mimic the replication of DNA in the human body. During the first step of amplification, double-stranded segments of DNA are separated or "denatured" into two strands through a heating process. The denatured DNA strands form a template that allows new strands to be manufactured identical to their former complementary strands. Each of the single-strand segments is then "hybridized" with "primers" or short DNA segments designed to bind with the template at a particular location ("locus") or locations ("loci") on the DNA strand. Finally, each primer serves as the starting point for "amplification" which copies or replicates the target sequence. As replication is occurring, an enzyme called a polymerase now becomes active. The polymerase enzyme facilitates repeated additions of bases to the primer until a new, complementary strand of the targeted DNA locus is created. The process is repeated a number of times, creating an exponentially increasing number of copies of the area where the original DNA resided. PCR "amplification" may yield a quantity of DNA sufficient to enable an analyst to create a sample that can then be typed during STR analysis.

STRs are multiple copies of an identical DNA sequence that are arranged in direct succession in a particular region of a chromosome. A STR repeat is one where the core base unit is just a few base pairs. Loci containing potentially testable STRs are positioned throughout the chromosome in large numbers. In PCR/STR typing, the forensic analyst seeks to determine the size of the repeat sequences by their migration in an electric field. This process is known as "electrophoresis".

D. Electrophoresis

During PCR amplification of STR fragments, the primers used contain florescent tags which become embedded into the STR fragments. During electrophoresis, these STR fragments are sorted according to length by "injecting" DNA into one end of a piece of gelatinous material which contains tiny holes that allow the material to function as a molecular

sieve. The longer the injection time, measured in seconds, the greater the amount of DNA being injected into that sieve. An electric current is then applied across the material which causes the STR fragments to move. Since it is easier for smaller fragments to move through the material, the smaller fragments move farther than the larger fragments. At the end of electrophoresis, the DNA fragments have been sorted by size as "alleles" which appear as visible "peaks" of different sizes on a computer printout similar to a graph.

E. Interpretation

An analyst then compares the configuration of these allele peaks against known reference standards to determine the number of alleles present at the target loci in a given sample. The signal generated during electrophoresis must be strong enough to create peaks of a sufficient height to be interpreted by an analyst. Only then can the analyst have enough confidence in the data to make an interpretation.

Given the minute quantities of DNA being typed and possible degradation of the evidence being analyzed through PCR/STR testing, it is critical that laboratories adhere to guidelines published by professional organizations like the Scientific Working Group on DNA Analysis Methods ("SWGDAM")[6/] in *Quality Assurance Standards for Forensic DNA Testing Laboratories* to ensure that PCR/STR test results are deemed reliable.[7/]

ARGUMENT

I.

THE BURDEN IS ON THE GOVERNMENT TO ESTABLISH UNDER *DAUBERT* AND RULE 702 OF THE FEDERAL RULES OF EVIDENCE THAT THE DNA TESTING CONDUCTED BY THE SEROLOGICAL RESEARCH INSTITUTE IS ADMISSIBLE

The government intends to offer evidence of the test results and the statistics derived from those results generated by the analysis of the DNA by SERI at the trial of this matter. As

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[6/] SWGDAM is a professional organization created and charged by the Director of the FBI with reviewing and recommending revisions as they become necessary to the *Quality Assurance Standards for Forensic DNA Testing Laboratories,* which in turn is published by the FBI.

[7/] Bruce Budlowe et al., *Low Copy Number –- Consideration and Caution,* FBI Lab. Div. No. 01-26, p. 4 (2001).

the proponent of scientific evidence, the government bears the burden of establishing its admissibility by a preponderance of the evidence. See, *Daubert v. Merrell Dow Pharmaceuticals, Inc.,* 509 U.S. 579, 592-93; *United States v. Rincon*, 28 F.3d 921, 923 (9th Cir. 1994). The admissibility of such evidence is "contingent upon a showing by the Government that the techniques, methods, and practices used in the testing . . . as well as the expert's qualifications meet with the generally accepted and established protocols." *United States v. Murrow, supra,* 374 F.Supp.2d 51, 62 (D.D.C. 2005).

Under *Daubert,* federal judges deciding the admissibility of scientific evidence perform a gatekeeping role and are required to exclude such evidence unless there is an adequate showing made by its proponent that the evidence is based on "sound science" and "the analysis undergirding the expert's testimony falls within the range of accepted standards governing how scientists conduct their research and reach their conclusions." *Daubert v. Merrell Dow Pharmaceuticals, Inc*., 43 F.3d 1311, 1316-1317 (9th Cir. 1995) (*Daubert II)*. *Daubert* requires that the proponent of scientific testimony establish that "the reasoning or methodology underlying the testimony is scientifically valid and that it can properly be applied to the facts in issue." *Daubert, supra,* 509 U.S. at 592-93; *Murrow, supra,* 374 F.Supp.2d at 60 (expert testimony based on scientific knowledge " . . . will not be admitted unless it is derived by a scientific method and is supported by 'appropriate validation.'")

The *Daubert* opinion provides a non-exhaustive list of relevant factors a district court might well consider in deciding whether to admit challenged scientific evidence. Those factors include: (1) whether the theory or technique underlying the testimony has been tested or validated; (2) whether it has been subjected to peer review and publication; (3) whether there is a known error rate for the particular methodology utilized; and (4) whether the methodology and procedures used have gained "general acceptance" in the scientific community.

> Widespread acceptance can be an important factor in ruling particular evidence admissible and "a known technique which has been able to attract only minimal support within the community," *Downing,* 753 F.2d at 1238, may properly be viewed with skepticism.

Daubert, supra, 509 U.S. at 594.

The hearing contemplated by *Daubert* is generally designed to assess the reliability of the methodology and procedures underlying the conclusions reached by the expert but part of the equation may well require an examination of the manner in which the methodology and procedures were applied in the facts of the particular case under consideration. *Kuhmo Tire Company, Ltd. v. Carmichael*, 526 U.S. 137, 154 (1999). The scope of inquiry at a *Daubert* hearing concerning a handwriting expert was discussed by the Ninth Circuit in *United States v. Prime*, 431 F.3d 1147 (9th Cir. 2005).

> In accordance with *Kumho Tire,* the broad discretion and flexibility given to trial judges to determine how and to what degree these factors should be used to evaluate the reliability of expert testimony dictate a case-by-case review rather than a general pronouncement that in this Court handwriting analysis is reliable. As the Supreme Court concluded, 'we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in *Daubert,* nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue. *Prime, supra,* 431 F.3d at 1152 (quoting *Kuhmo Tire,*526 U.S. at 150.

Subsequent to the Supreme Court's decision in *Daubert,* Rule 702 of the Federal Rules of Evidence was amended to broaden the scope of the trial court's inquiry when the admissibility of scientific evidence is at issue. Rule 702 now provides: "A witness who is qualified as an expert by knowledge, skill, experience, training or education may testify in the form of an opinion or otherwise if: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case." See also, *Rudd v. General Motors Corporation*, 127 F.Supp.2d 1330, 1337-39 (M.D. Ala. 2001) ("[T]he plain language of the new Rule 702, as well as the advisory committee notes to the new Rule, make it clear that this court is now obliged to screen expert testimony to ensure it stems from, not just a reliable methodology, but also a sufficient factual basis and reliable application of the methodology to the facts . . . Under the newly-amended Rule 702, however, a "quantitative" inquiry into whether "the testimony is based upon sufficient facts or data" is not only permissible but expressly mandated.") In the context of the issues before this Court concerning the admissibility of the PCR/STR test results achieved by SERI and the statistical calculations it

made based on those results, the broad scope of inquiry recognized in *Rudd* is supported by the Advisory Committee Notes that accompanied the amendment of Rule 702.

> The amendment specifically provides that the trial court must scrutinize not only the principles and methods used by the expert, but also whether those principles and methods have been properly applied to the facts of the case. As the court noted in *In re Paoli R.R. Yard PCB Litig.,* 35 F.3d 717, 745 (3rd Cir. 1994), '*any* step that renders the analysis unreliable . . . renders the expert's testimony inadmissible. *This is true whether the step completely changes a reliable methodology or merely misapplies that methodology.*" (Emphasis in the original.)

In the context of cases involving the admissibility of PCR/STR testing, the court in *United States v. Martinez*, 3 F.3d 1191, 1197 (8th Cir. 1993) noted: "[T]he fact that we have taken judicial notice of the reliability of the technique of DNA profiling does not mean that expert testimony concerning DNA profiling is automatically admissible under *Daubert*. A number of courts have required that the trial court further inquire into whether the expert properly performed the techniques involved in creating the DNA profile." See also, *United States v. Beasley*, 102 F.3d 1440, 1448 (8th Cir. 1997) ("In every case, of course, the reliability of the proffered test results may be challenged by showing that a scientifically sound methodology has been undercut by sloppy handling of the samples, failure to properly train those performing the testing, failure to follow appropriate protocols, and the like.")

The PCR/STR testing conducted by SERI in this case and its calculation of the number of people who shared Esau Ferdinand's genetic profile invokes questions as to the methodology, procedure and execution of the SERI evidence and its admissibility.

CONCLUSION

For the foregoing reasons, Defendant Ferdinand respectfully requests that the evidence of the DNA testing SERI conducted in this case be excluded, and Defendant Ferdinand requests that a *Daubert* hearing be scheduled to better inform the analysis of the factual and legal issues raised by this motion.

Dated: December 1, 2015

/s/
ROBERT WAGGENER
Attorney for Defendant
ESAU FERDINAND